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formed chronicler and a sympathetic interpreter of Pasteur, it is doubtless true that Smith represents a type of mind and workmanship much more like that of Pasteur himself. He, like Pasteur, has fought the pioneer's battles and keenly relished the fray. One who knows this is prepared to find everywhere, in the introduction, in the translator's notes which are scattered through the book and especially in the annotations at the close a certain flavor quite other than Duclaux himself could impart.

The translation is avowedly addressed to the younger generations of American scientists who are liable to forget the dramatic conflicts through which were won the ways to the higher and freer conceptions which they have inherited. For this reason the book (and the translation better than the original) should serve admirably as a reading book about which a seminary may be conducted with students desiring to trace the history of biological thought during the last century. The reviewer proposes so to use it. For such purposes there is much gained through the addition by the translators at the close of the book of an annotated list of all persons to whom reference has been made in the text. Here as elsewhere there is evidence of those intimate, highly individualistic, personal touches through which Duclaux and Smith in combination have served to reflect so much of the dominant individualism of Pasteur.

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NOTES ON METEOROLOGY

THE DISTRIBUTION OF MAXIMUM FLOODS

In an interesting paper read before the American Meteorological Society at its New York meeting, January 3, 1920, Professor A. J. Henry⁴ analyzed the flood records of many of the streams of America and Europe with a view to determining their time and space distribution, and, if possible, any systematic or cyclic recurrence.

⁴ "The Distribution of Maximum Floods," *ibid.*, pp. 861-866.

For the purpose of his discussion, Professor Henry has used the "average annual flood," which is defined as "the arithmetical mean of the annual floods for a number of years"; also the "maximum flood" which is that caused by excessive run-off when the rainfall is sufficient to raise the ground storage to a high level and thus saturate the soil, or when a warm rain falls on a snow cover; and finally, the "absolute maximum flood" which is the greatest reported for a given station. It is important to know what the absolute maximum flood magnitude is for a given place, and to know whether that maximum has been reached. Says Professor Henry:

It can not be too strongly emphasized that the occurrence of the absolute maximum flood is usually conditioned upon the synchronism of certain climatic events which in themselves have no fixed law of occurrence. Very intense rainstorms are seldom long continued and of great extent. The heavy summer showers that occur in the United States being limited in area may cause an extraordinary flood in a small watershed, and doubtless many such floods occur in some part of the country annually. These extreme floods in small streams are completely absorbed as soon as they reach the trunk stream.

To the end of determining any relation between the absolute maximum and the average, the ratios of these two values have been tabulated for 45 of the principal rivers of the United States. The agreement of the various ratios is, as the author remarks, "better than was expected," amounting in general from 1.3 to 1.5; that is, the absolute maximum flood was 1.3 to 1.5 times the annual average. There are a number of ratios of greater magnitude, but, in most cases, this is accounted for either in the nature of the watershed, or the local conditions surrounding the gaging. Small ratios are found at places where overflow takes place easily and the river may greatly increase its cross-section.

There appears to be no cyclic distribution of floods but "that the dominating control is rainfall, and since there may be one, two or even three years of excessive rainfall, it follows that great floods may likewise occur

in successive years." Even for the same stream floods are a local phenomenon. An example of this is the record for Cincinnati and Pittsburgh, both on the Ohio River: the ten greatest floods are arranged in order of their magnitudes for the two stations (many other stations are tabulated in the paper), with the following result:

Station	Order of Magnitude									
	1	2	3	4	5	6	7	8	9	10
Cincinnati	1884	1913	1883	1907	1918	1898	1897	1901	1890	1882
Pittsburgh	1907	1884	1902	1913	1891	1861	1908	1862	1904	1897

Of the European rivers, the Danube, the Seine, the Neckar, the Rhine and the Main are investigated. The records of floods in these rivers extend back many centuries and would provide ample data for any periodic recurrence, but these also are found to be dependent upon the nature of the watershed and the rainfall distribution. The conclusions derived from the paper are:

1. The records of both American and European rivers show an average of 7 to 10 great floods per century.

2. Great floods are primarily due to precipitation, and that precipitation, in the form of rain, which produces floods may be of two distinct types, (a) so intense and widely distributed as to produce flooding regardless of antecedent conditions; (b) moderate rains continued intermittently for eight to ten days or more with antecedent conditions favorable to high run-off.

3. There does not appear to be an orderly progression in the magnitude of floods with the lapse of years; that is to say, the absolute maximum flood of any 100-year period is not necessarily greater than the absolute maximum flood for the preceding 100 years.

4. The magnitude of great floods with respect to the average annual flood, seems to increase in geometrical progression but apparently wholly regardless of the flow of time.

5. Great floods like great rainfalls are essentially a local phenomenon even for the same stream.

This paper was discussed by Mr. Robert E. Horton,⁵ the hydrologic engineer, who is of the opinion that the occurrence of maximum floods is fortuitous and that the combinations

of causes which may cause a maximum flood are very much more limited than the number of combinations which may cause ordinary floods.

NOTES

THE spring announcement of MacMillan books contains the notice of a text-book on "Agricultural Meteorology," by Professor J.

Warren Smith, of the United States Weather Bureau. This is the first text-book exclusively devoted to this subject and is certain to find a large demand, not only from agricultural colleges and universities, but also from the farmer and general reader, to whom it will be of practical value.

IN the October, 1919, *Monthly Weather Review*, there are several short articles and abstracts on forecasting from local signs, such wind direction, clouds, pressure change, clouds, sky colors, and the scintillation of the stars. It is interesting to note the difference in character of the forecasting problems in Europe, where data is incomplete from the west, and in America, where more data is available but a greater diversity of local problems is encountered.

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SPECIAL ARTICLES

A SIMPLE METHOD FOR TITRATING ELECTROMETRICALLY TO A DESIRED END POINT IN ACID-ALKALINE REACTIONS

SÖRENSEN¹ and Clark and Lubs² have published detailed directions for the preparation

¹ Sörensen, "Über die Messung und Bedeutung der Wasserstoffionenkonzentration bei biologischen Prozessen," *Ergebnisse d. Physiologie*, 12, 393, 1912.

² Clark and Lubs, "The colorimetric determination of hydrogen ion concentration and its application in bacteriology," *Jour. Bacteriology*, 2, pp. 1, 109, 191, 1917.

⁵ *Ibid.*, pp. 866-867.